



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/848,997	05/04/2001	Lup San Leong	1016-013	8978

22898 7590 01/16/2004

THE LAW OFFICES OF MIKIO ISHIMARU
1110 SUNNYVALE-SARATOGA ROAD
SUITE A1
SUNNYVALE, CA 94087

EXAMINER

GUERRERO, MARIA F

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 01/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/848,997

Applicant(s)

LEONG, LUP SAN

Examiner

Maria Guerrero

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-6 and 8-20 is/are pending in the application.
- 4a) Of the above claim(s) 15-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-6 and 8-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 14.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This Office Action is in response to the Amendment filed October 20, 2003.

Claims 1 and 7 are canceled.

Claims 2-6 and 8-20 are pending.

Election/Restrictions

2. Applicant's election of Group I claims 1-14 in Paper No. 3 is acknowledged.

Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 15-20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 3.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 2-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Levert et al. (U.S. 6,407,006) in view of Smith et al. (U.S. 6,022,812) (cited on Levert et al. reference) and Twu et al. (U.S. 6,589,872).

Lever et al. teaches placing a semiconductor wafer having an interlevel dielectric layer (ILD) on a wafer holder of an oven, applying mechanical pressure to the ILD layer using a mechanical device, applying heat simultaneously with the mechanical pressure (col. 7, lines 60-68, col. 26, lines 24-26). Lever et al. shows applying the mechanical pressure includes relative motion (second rotary motion) to assist in planarization, providing a non-sticking motion, sensing and controlling the temperature of the mechanical device (Abstract, col. 8, lines 5-15). Lever et al. shows the mechanical device using a roller. Lever et al. inherently shows providing a traverse motion (col. 7, lines 20-27).

Lever et al. does not specifically show rotating the wafer holder to apply a first rotary motion to the semiconductor wafer. However, Lever et al. discloses any suitable art-known objects can be used as planarization objects to assist in the planarization process (col. 7, lines 13-27). In addition, Twu et al. is cited as evidence to show that rotating the semiconductor wafer during planarization and applying traverse motion is conventional used in the art (Fig. 1, 3a, col. 2, lines 58-67, col. 3, lines 1-5, col. 4, lines 60-65).

Lever et al. does not specifically show reflowing the interlayer dielectric layer. However, Smith et al. teaches a reflowing step to planarize and increase film strength (col. 2, lines 20-26).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Lever et al. reference by including the first rotary motion to the semiconductor wafer as taught by Twu et al. and the reflowing step as

Art Unit: 2822

taught Smith et al. in order to increase the film strength and improve the grade of planarity on the surface of the film.

4. Claims 8-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Levert et al. (U.S. 6,407,006) in view of Oaks et al. (U.S. 6,083,661) and Smith et al. (U.S. 6,022,812) (cited on Levert et al. reference) and Doan et al. (U.S. 6,331,488).

Levert et al. teaches placing a semiconductor wafer having an interlevel dielectric layer (ILD) on a wafer holder of an oven, applying mechanical pressure to the ILD layer using a mechanical device, applying heat simultaneously with the mechanical pressure (col. 7, lines 60-68, col. 26, lines 24-26). Levert et al. shows applying the mechanical pressure includes relative motion (second rotary motion) to assist in planarization, providing a non-sticking motion, sensing and controlling the temperature of the mechanical device (Abstract, col. 8, lines 5-15). In addition, Levert et al. teaches spinning a low dielectric constant ILD material and curing the low dielectric constant ILD material (col. 3, lines 10-15, 53-60, col. 7, lines 45-65, col. 17, lines 17-55). Levert et al. inherently shows providing a traverse motion. Levert et al. shows the mechanical device using a roller (col. 7, lines 20-27). Furthermore, Levert et al. teaches an annealing process (col. 24, lines 53-60).

Levert et al. does not specifically describe soft baking the low dielectric constant ILD material at a soft bake temperature, holding the low dielectric constant ILD material at a temperature below the hard bake temperature (between 100°C and 400°C). However, Oaks et al. describes soft baking the low dielectric constant ILD material at a soft bake temperature, holding the low dielectric constant ILD material at a temperature

Art Unit: 2822

below the hard bake temperature (between 100°C and 400°C), and hard baking the low dielectric constant ILD material (col. 16, lines 60-65, col. 17, lines 10-15, col. 19, lines 65-67).

Levert et al. does not specifically show rotating the wafer holder to apply a first rotary motion to the semiconductor wafer. However, Levert et al. discloses any suitable art-known objects can be used as planarization objects to assist in the planarization process (col. 7, lines 13-27). In addition, Twu et al. is cited as evidence to show that rotating the semiconductor wafer during planarization and applying traverse motion is conventional used in the art (Fig. 1, 3a, col. 2, lines 58-67, col. 3, lines 1-5, col. 4, lines 60-65).

Levert et al. does not specifically show reflowing the interlayer dielectric layer. However, Smith et al. teaches a reflowing step to planarize and increase film strength (col. 2, lines 20-26).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Levert et al.'s process by specify the use of a conventional soft bake as taught Oaks et al. in order to remove the solvent not removed during the spin-coating process (Oaks et al., col. 19, lines 65-67) and including the first rotary motion to the semiconductor wafer as taught by Twu et al. and the reflowing step as taught Smith et al. in order to increase the film strength and improve the grade of planarity on the surface of the film.

Response to Arguments

5. Applicant's arguments with respect to claims 2-6 and 8-14 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Webster's II New Riverside University Dictionary is cited as evidence to show that according to the definition of the term traverse; Levert et al. inherently teaches the traverse motion. Doan et al. (U.S. 6,331,488) and Murphy et al. (U.S. 5,478,435) are cited as evidence to show that rotating the semiconductor wafer during planarization is conventional used in the art.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2822


the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Webster's II New Riverside University Dictionary is cited as evidence to show that according to the definition of the term traverse; Levert et al. inherently teaches the traverse motion.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Amir Zarabian can be reached on 571-272-18525. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communication.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Maria Guerrero
Primary Examiner
January 12, 2004